

## 2007-2008 Undergraduate Research Award Scholars Statements of Specific Aim(s), Purpose, or Goal(s)

Undergraduate Research Awards this year have been awarded to 31 students conducting research in various disciplines and departments across campus. The funded research projects are being conducted in American Studies, Ancient Studies, Biochemistry, Biological Sciences, Chemistry, Computer Engineering, Dance, Economics, English, Film, History, Information Systems, Mathematics, Mechanical Engineering, Modern Languages and Linguistics, Music, Political Science, Psychology, and Visual Arts. Feel free to read the abstracts that summarize each research project, and mark your calendars to attend **Undergraduate Research and Creative Achievement Day on Wednesday, April 23, 2008** to see these students present their research findings.



**Anna An**, Music

“Adventure in Learning the Language of Music”

Faculty Mentor: Professor Airi Yoshioka, Department of Music

Expected Graduation Date: Spring 2009

This study will focus on the individual development of my skills on the violin in order to become an accomplished performer and a knowledgeable teacher. I received an excellent opportunity to visit my own country, South Korea, this summer to study under Joo Yung Pak, one of the violin professors at Seoul University. When I arrive in Korea, I will also be auditioning to summer music festivals that are held in Seoul. Through this research, I will investigate to improve and learn new ideas and skills in the language of music. I will take lessons with different professors who are engaged in one of the most illustrious music universities. I will also get a chance to meet and learn from different violinists from various famous orchestras. These world-class faculties along with other faculties will coach the chamber ensembles, master classes (inviting other students to view the lessons), and help prepare the students to become professional musicians by suggesting different strategies for practice, how to communicate along with the members of the chamber ensembles and orchestras, how to analyze the musical scores, how to prepare for professional auditions and the proper stage etiquettes. By participating in the orchestra, I will familiarize myself with major orchestral repertoire and through performing in concerts, I will be able to learn how to invite the audience to the world of music that I will be creating along with the other members and the conductor in the orchestra. These comprehensive experiences with hardworking students and faculties will not only improve my skills but will impact my life with new ideas that will shape my career as a teacher and a violinist.



**Tawny Barin**, Information Systems

"Gender Differences in the Use of Social-Networking Websites"

Faculty Mentor: Dr. Anita Komlodi, Department of Information Systems

Expected Graduation Date: Spring 2008

This study investigates the rising significance of social networking sites in the lives of college-age users. We will specifically look at the gender differences in use of these sites, exploring whether there are any differences in how male and female users represent themselves and relate to their self-representations. Data will be collected from thirty participants, fifteen male and fifteen female college students ranging from the ages of 18-21, via participant interviews, observation of their regular use, and analysis of the content of their public social networking profiles. The results will help us gain a better understanding of how and why interaction within online communities has become such a significant part of life for this user group, despite the lack of face-to-face communication, and in the areas of sociability and usability of online communities in general.



**Joshua F. Betz**, Mathematics and Psychology

"Backpropagation Analysis of Ischemic Brain Disease in a Community-Dwelling Sample"

Faculty Mentor: Dr. Shari Waldstein, Department of Psychology

Expected Graduation Date: Summer 2007

Cardiovascular disease and its sequelae are a pervasive threat to public health. Ischemic brain disease, which precedes cerebrovascular accidents, is marked by ventricular enlargement, widening of the sulci, brain atrophy, and white matter hyperintensities as measured with magnetic resonance imaging. The neurocognitive impairments of cerebrovascular disease are detectable by tests of attention, memory, processing speed, and visuospatial tasks. The goal of this project is to develop a backpropagation heuristic for determining an expected neurocognitive profile for an individual given demographic information and information coded from MRI imaging. If successful, this heuristic could be used to identify those at risk for neurocognitive impairment due to silent cerebrovascular disease processes.



**Andrej Bevec**, Visual Arts – Animation

"Short Animated Film"

Faculty Mentor: Professor Eric Dyer, Department of Visual Arts – Animation

Expected Graduation Date: Spring 2008

The goal of this project is to create a short animated film with traditional two-dimensional techniques. It will explore the effectiveness of short narrative in a largely silent space; in this case the film will have no dialog. The animation will focus on the ordinary early-morning activities of a man who lives in a city where the buildings, rather than the people, move: a living city where commuters line streets waiting for their offices. Thematically it will address the helplessness of man in the sprawl of urban topology and modern living. Stylistically it will differentiate itself from most other animation by building upon the visual aesthetic of film noir, utilizing stark black and white, multi-layered backdrops and deeply shadowed characters. Technically the project will be carried out through established two-dimensional animation practices: after storyboarding the film will be planned and scored with an animatic. The characters will then be timed and drawn from pose to pose, after which in between drawings will be made to create a sense fluid motion.



**Amina R. Bhatti**, Psychology and Social Work

“The Role of Age, Identity Development, and Stress in Predicting Risk Behaviors and Depression in Adolescent Mothers”

Faculty Mentor: Dr. Charissa Cheah, Department of Psychology

Expected Graduation Date: Spring 2008

The proposed study will examine how age, identity development and stress contribute to risk taking behaviors in a sample of 70 inner-city adolescent mothers. The interaction between age, identity development, and high stress is hypothesized to predict risk behaviors and depression. Adolescent mothers’ risk behaviors will also be compared to national normative data on adolescent engagement in risk behaviors. Data will be collected through Project ADVANCE, an ongoing study on adolescent mothers and their children. Results from this study will provide the basis for the development and implementation of more effective prevention programs promoting positive development in urban adolescents.



**Weston Bittner**, Ancient Studies

"Site Hierarchy and Social Status in the Mycenaean Kingdom of Pylos"

Faculty Mentor: Dr. Marilyn Goldberg, Department of Ancient Studies

Expected Graduation Date: Spring 2008

Until recently the archaeological study of the Mycenaean culture has been largely unbalanced because of the focus on excavation of the palatial center and Linear B texts from the palace at Pylos. As a result there appears to be a large gap between the wealthy and the general population. This summer I will be participating in an archaeological field school, the Iklaina Archaeological Project (IKAP). IKAP shifts the focus from the palatial center to one of the administrative districts, identified through references in Linear B tablets. In this way IKAP is attempting to reconstruct the settlement pattern and hierarchy of a Mycenaean district and move its focus away from the palatial center. The goal of my research is to discover if the current picture of Mycenaean culture is valid or whether in

fact there was much greater diversity of settlement and social class than is now known. This project will be based on hard evidence rather than a biased research focus. Even if it turns out there was not a diverse hierarchy in ancient Pylos I feel the research will still be a success in accomplishing its goal of diversifying the vocabulary of evidence available in the study of the Mycenaean culture.



**Cally E. Brandt**, Ancient Studies

“Two Media, Same Metamorphoses: The Works of Ovid and Bernini”

Faculty Mentor: Carolyn G. Koehler, Department of Ancient Studies

Expected Graduation Date: Spring 2009

As the Renaissance faded into the Baroque style of art, Bernini worked marble into some of the most moving representations of Ovid’s masterful poem, the *Metamorphoses*. I plan to discover the connections between Bernini’s sculptures, Pluto and Persephone, Apollo and Daphne and Aeneas in his *Flight from Troy*, and the work of Ovid, an ancient Roman poet of the late 1st century B.C. – early 1st century A.D. With detail that provides a unique reading of the *Metamorphoses*, Bernini retells Ovid’s poem, so that not only do the images enrich the text, but also the text illuminates the visual representations. I shall examine the formal artistic values of the sculpture with the literal translation of text, and compare the differing personalities of the characters. There is a possibility of the convergence of ideas about the *Metamorphoses*, raising one’s awareness of a more accurate and insightful interpretation of the whole work.



**Devin Burns**, Mechanical Engineering

"Tensile and Bending Behavior of Polymer Rapid Prototype Materials Coated with Copper and Nickel"

Faculty Mentor: Dr. Marc Zupan, Department of Mechanical Engineering

Expected Graduation Date: Spring 2008

Rapid prototype parts are now commonly used by designers in the product development cycle. Historically, these parts made from rapid prototype materials, have suffered from poor mechanical behavior most notably low stiffness, low toughness, and creep. These mechanical deficiencies often preclude rapid prototype materials from being used for functional evaluation. It is believed that electroplating a metallic phase over the polymer rapid prototype specimens improves mechanical response. This work presents the mechanical testing and analytical modeling of metallic coated polymer rapid prototype specimens. Rapid prototype specimens with polymer fibers parallel to an applied load and others built at angles to an applied load are constructed to observe the effect of build orientation on the mechanical response of the prototypes. Experimental measurements of prototype specimens plated first with 125  $\mu\text{m}$  copper and then 125  $\mu\text{m}$  nickel are compared with un-plated prototype specimens of the same build orientation enabling direction

observation of mechanical improvement. Mechanical response is evaluated with cantilever bend, and uniaxial tension testing. Testing shows stiffness increasing 20 fold. Vickers hardness testing is used to measure polymer-metallic interface properties. Analytical models are developed to capture material response and to predict the response of new material combinations.



**Paul Carmack, Music**

“Homeless Not Hopeless: A CD for Charity”

Faculty Mentor: Dr. David Kim-Boyle, Department of Music

Expected Graduation Date: Spring 2010

For years there has been a major problem with homelessness across the nation. In an attempt to do my part to help this growing problem, I will make a CD of musicians that perform daily on the very streets that the homeless live. These musicians are constantly playing instruments, ranging from saxophones to buckets and trashcans, trying to earn money to support themselves. My plan is to get the proper equipment that I will need in order to create the highest quality recordings possible outside of a professional studio. After I have compiled enough recordings to create a full-length album, I will then return to the studios at UMBC for mixing, editing and mastering. After I have created the CD, I will need to have the CDs duplicated and packaged. After I have received the duplicated CDs, I will sell the CDs, donating all of the money that I make to charity. I would like to do my part to help those that are less fortunate than me, and I feel that no matter how much money I donate, I will still be helping as much as possible to help a major issue that Americans live with every single day.



**Pei-Chun Chen, Biochemistry**

“The Investigation of Toxic Crotamine as a Drug Carrier”

Faculty Mentor: Dr. Richard L. Karpel, Department of Chemistry and Biochemistry

Expected Graduation Date: Spring 2008

Crotamine is a very toxic component of the South American rattlesnake’s venom, and is known to kill at millimolar levels. However, the interest in this protein is not to learn how it kills lives, but how it can save lives. It has been observed that this protein has the ability to penetrate cell membranes and localize in the chromosome, while carrying plasmid DNA. These properties make it a good candidate for drug delivery. The principal goal of this investigation is to provide the binding properties of this protein to nucleic acids, as these will be important to the design of the protein’s cargo in its use in gene therapy. So far, we have only observed molecular binding from this protein when binding it to short-strand (25 bp) DNA. Long-strand DNA forms aggregates with the protein. In order to identify the binding site size, affinity, and preference for either single or double strand nucleic acids at the molecular binding level, we will first identify the approximate length of DNA at which

the aggregation starts to occur, and then proceed to identify those other binding properties with DNA shorter than the aggregation length.



**Evan Devine**, Film/Video  
“A Study of Kurt Kren and Experiments in Structural Film”  
Faculty Mentor: Fred Worden, Department of Visual Arts  
Expected Graduation Date: Fall 2008

The main focus of this study is filmmaker Kurt Kren, his filmmaking process and the content of his work. The insight gained from this research will be applied to a film where I will focus on the public surveillance cameras in Baltimore. The final output of this project will include a paper on Kurt Kren, a film and a screening of Kren’s film. The screening of Kren’s work will be accompanied by an introduction to place his work into a more accessible context.



**Matthew J. Dolamore**, Modern Languages and Linguistics  
“National Identity in Monuments – An on-site Analysis of the Interactions between Russia’s Youth and Moscow’s Public Monument Sites”  
Faculty Mentor: Dr. Elaine Rusinko, Department of Modern Languages and Linguistics  
Expected Graduation Date: Spring 2008

This will be a study of the role(s) and function(s) of monuments in the formation of post-Soviet Russian national identity. Focusing on Russia’s youth, I will be researching public behavior and the interactions between the Russian people and certain monuments positioned in urban public space. Research methods will include, among others, participant observation, the collection of detailed fieldnotes, a content analysis of related literature and in-person interviews. Particular attention will be given to the historical/political influence each monument holds in defining the current and future national identity of Russian young people. A study made more relevant in light of today’s political reality, given that 2007 will be President Putin’s final year in office, this project will advance our understanding of the contemporary Russian political and social landscapes.



**Carly Engelke**, Dance  
“Summer Study at Pro Danza Italia”  
Faculty Mentor: Doug Hamby  
Expected Graduation Date: Spring 2008

I will be studying many different techniques in dance, composition, and improvisation. I will spend three weeks in Castgioncello, Italy at Pro Danza Italia. After training with many top professionals in the dance field I will use the techniques I learn to create my Senior Piece. My senior piece will be a six to ten minute dance presented in the 2007 Fall Senior Dance Showcase, performed by other dancers. Besides showing my growth as a choreographer, my piece will give audiences something to enjoy and relate to. It will showcase the dancer's interpretations of techniques and styles I learned in Italy. In following years other seniors creating their capstone projects will use what they learn through watching my piece to create their pieces; the performers will also learn from their experiences in rehearsal and onstage.



**John Glaros**, Computer Engineering  
“Self-Configuring, Modular Centipede Robot”  
Faculty Mentor: Tim Oates, Department of Computer Engineering  
Expected Graduation Date: Spring 2008

This study will design a modular centipede robot that has the ability to reconfigure. The system will be able to autonomously form different numbers of centipedes of different lengths as conditions of the environment change. The system is designed with the goal of being able to traverse and explore rough terrain. Modules consist of four legs and a two-degree freedom torso. Also, a worm gear mechanism on each module is used to form solid connections with others. This system is classified as a swarm robot, opposed to a reconfigurable robot, because each individual module controls itself. Concepts from swarm intelligence, robotics, machine learning, mobile ad-hoc wireless networks, distributed systems, and team formation may be applied to this system.



**Michael Herder**, Music  
“Further Studies in Music Performance”  
Faculty Mentor: Dr. Airi Yoshioka, Department of Music  
Expected Graduation Date: Spring 2010

As a violin performance major it is important to expand my abilities as a performer. This involves learning as much technique as I possibly can and incorporating it into my practice and my performances. This summer I will be attending the Killington Music Festival in Rutland, Vermont and will be furthering my violin technique. I will be focusing on better articulation of the left hand and more control of the bow arm. This time that I will be spending at the summer festival will be very important because I will have much more time to devote to my violin than I do during the school year. My teachers at Killington will be some of the most respected musicians. It is important that I put myself under the direction of experienced teachers so that I can learn how to be a better teacher myself. Directing a student who is having trouble in a particular area of violin technique can be very baffling

for a teacher at times. Putting myself under these teachers' directions, who have much experience figuring out exactly what the next step their students should take, will give me the ability and the knowledge that I need to be an effective teacher. Through their example I will be a useful tool in teaching the next generation.



**Uzoma K. Iheagwara**, Biological Sciences

“Uveal Melanoma Vaccines Express Major Histocompatibility Class II Molecules that Traffic to the Cell Surface in the Absence of Invariant Chain”

Faculty Mentor: Suzanne Ostrand-Rosenberg Ph.D., Professor,  
Department of Biological Sciences

Expected Graduation Date: Spring 2008

Primary uveal melanoma is the most common cancer of the eye and is universally fatal in the 50% of patients that develop metastatic disease. We are developing cell-based vaccines that consist of tumor cells transduced with genes encoding Major Histocompatibility Class II (MHC II)  $\alpha$  and  $\beta$  chain, and costimulatory molecule CD80. Previous studies in animal models have shown that expression of MHC II in the absence of accessory molecule Invariant Chain (Ii) is essential for these cell-based vaccines to present endogenous antigens, activate CD4+ T-helper cells and induce protective anti-tumor immunity. The current paradigm is that MHC II  $\alpha$  and  $\beta$  chains assemble with Ii in the Endoplasmic Reticulum (ER), where Ii: (i) stabilizes the  $\alpha\beta$  heterodimer complex, (ii) blocks ER resident (endogenous) peptides from binding MHCII, and (iii) targets MHC II to the endocytic pathway. MHC II molecules traffic from the ER to the Golgi Apparatus (GA) and subsequently take the endosomal-lysosomal route to the cell surface. It is unclear how MHC II molecules traffic to the cell surface in the absence of Ii. Uveal melanomas originating in the immune privileged eye do not express MHC II and Ii, even in the presence of exogenous Interferon- $\gamma$ , due to methylation of the Class II trans activator (CIITA). Therefore, these tumor cells are suitable candidates for cell-based vaccine development. We hypothesize that MHC II transduced uveal melanoma cells express MHC II molecules intracellular and at the cell surface in the absence of Ii.

With the transduced uveal melanoma vaccines, we plan elucidating the mechanism through which our vaccines work. Dendritic cells are widely known as the best immunological agent for activation of T-lymphocytes. These so called professional antigen presenting cells (APCs) may be another mechanism through which our vaccines might function. Previous mouse studies have indicated that our vaccines transfer their peptide Major Histocompatibility Class II (pMHC) completely intact to DC's. This phenomenon is known as cross-dressing. Through the use of confocal microscopy and flow cytometry, we hope to visualize the adoptive transfer.



**Hasina Jamal**, Computer Engineering  
"Quantum Cascade Laser Based Photo-Acoustic Sensors"  
Faculty Mentor: Dr.Fow-Sen Choa, Department of Computer Science  
and Electrical Engineering  
Expected Graduation Date: Spring 2009

The goal of this project is to construct a miniature gas-sensing instrument using photo-acoustic sensors (PASs) and quantum cascade lasers (QCLs). Gas-sensing using PASs and CO<sub>2</sub> lasers can be very sensitive (down to the ppb range) since the PASs directly detect each gas molecule's vibrational energy spectrum in the Mid-IR range. This type of gas-sensing can be useful for detecting explosive or toxic chemicals. Therefore, gas-sensing with photoacoustic detection is becoming increasingly important in homeland security applications. QCLs are perfect for the job, as they are compact, with typical dimensions of 3.0 mm x 0.5 mm x 0.2 mm. The object of this research is to build a prototype gas-sensing instrument. First, detected signals will be analyzed to qualitatively identify a specific gas (CO, NO, NH<sub>3</sub>, or NO<sub>2</sub>). Then, the system will be calibrated so that quantitative measurements of the gas concentration can be taken. In summary, the goal of this research project is to use QCLs and PASs to build a compact explosive and toxic gas detection system with both qualitative and quantitative detection capabilities for homeland security applications.

**Cheryl Jaworski**, Interdisciplinary Studies  
"Christina Stead's Religion of Love and the New Science of the Mind"  
Faculty Mentor: Dr. Piotr Gwiazda, Department of English  
Expected Graduation Date: Spring 2008

My purpose is to research the unpublished papers of the modernist Australian author Christina Stead as background material for a literary analysis of two of her novels—*The Man Who Loved Children* (1940) and *For Love Alone* (1944)—from the viewpoint of a new field in literary criticism, viz. Darwinian literary criticism (also known as “adaptationist” or “evolutionary” literary criticism). My research for the analysis will draw upon empirical findings about human nature offered in the field of evolutionary psychology. With this research, I hope to take a fresh perspective on the work of an original, difficult, and seldom understood author. This analysis will also mark the first extension of Darwinian literary criticism into Australian literature.



**Dorothy Kenny**, Biology and History

“What’s in a Name?: The Use of DNA Barcoding in Species Identification and Discovery.”

Faculty Mentor: Dr. Kevin Omland, Department of Biological Sciences

Expected Graduation Date: Fall 2008

In 2003, ecologist Dr. Paul Hebert proposed a new system for identifying species of animals. A single mitochondria gene, cytochrome oxidase I (COI), would act as a barcode, distinguishing organisms in any given region as if they were soup cans on a shelf. Since then, the concept of DNA barcoding has fueled a great deal of scientific debate over the simplification of all the morphological and genetic variables which are part of traditional species identification. The Barcode of Life Database (BOLD) sets the minimum percent of genetic divergence between two species to be one percent. If two organisms fall below this point, they will be classified as one single species. This project aims to test this identification system across the closely related New World Orioles. By sequencing the COI gene in all 25 oriole species, and then finding the divergence between these sequences, we can begin to understand the complexity of species limits and to question the nature of objective classification.

**Lynna Kiere**, Biological Sciences

“Reconstructing Evolution of Cacique Carotenoid Color”

Faculty Mentor: Dr. Kevin Omland, Department of Biological Sciences

Expected Graduation Date: Fall 2008

This project focuses on the evolution of plumage color in caciques, a group of Central and South American blackbirds. Like many bird species, caciques use carotenoid pigments to create colorful plumage. Unlike orioles which have been similarly studied, caciques do not show a complete continuum of colors from yellow through various oranges to red. Rather, they seem to be divided into a “yellow” group and a “red” group, with no orange intermediates. Over the past year, I have gathered quantitative color data on these birds to determine if the “yellow” and “red” caciques are indeed two discrete groups. I used these data to reconstruct the evolution of cacique carotenoid color to deduce the color of the ancestral cacique and examine color change over evolutionary time. Work in the coming year will focus on the other, and often more time-consuming part of the scientific process, sharing and publishing results. It is critical to learn to communicate effectively to diverse audiences and in many different formats. I will be preparing a manuscript for publication in a peer-review biology journal, presenting this work at one or more scientific meetings, and otherwise working to learn the communication skills necessary in research biology. Much of this time will be spent at the Autonomous University of Mexico in Mexico City, where I

will learn not only to communicate about my work across disciplines, but also across culture and language barriers.



**Matthew Malinowski**, Chemistry

“One dimensional diffusion of Gene 32 protein along dsDNA to ssDNA”

Faculty Mentor: Dr. R. Karpel, Department of Chemistry and Biochemistry

Expected Graduation Date: May, 2009

The focus of the experiments will be on the gene 32 protein (gp32) of bacteriophage T4 which is a single strand specific DNA binding protein. In most genomes single stranded regions are few and far between, and exist only when the DNA is under repair, replication or recombination. As a result it is highly improbable that any gp32 that collides with the DNA will attach to single stranded DNA (ssDNA). Therefore, it is believed that the protein will weakly bind the double stranded DNA (dsDNA) it encounters and then move along the dsDNA until it finds an area of ssDNA to which it can bind. To determine if this is true, the rates of reaction between gp32 and ssDNA, dsDNA, hybrid dsDNA/ssDNA and DNA/ethenoA substrates will be measured and compared. These rates will be determined by observing changes in fluorescence of tryptophan through the use of a stopped-flow instrument in order to determine whether or not gp 32 is capable of diffusing along dsDNA.



**Ari Ne'eman**, Political Science and Economics

"The Correlation between Eastern European Economic Development and Electoral Stability"

Faculty Mentor, Dr. Carolyn Forestiere, Department of Political Science

Expected Graduation Date: May, 2010

The purpose of this research is to examine the correlation between executive alternation and economic development with a focus on which economic policies and results are most conducive to specific political outcomes in transitional countries. My research will have a heavy regional focus, consisting entirely of Eastern European countries. The purpose of the research will be to analyze the frequency of party change within the executive institutions since democracy and multi-party elections were implemented in Eastern Europe. Furthermore, I intend to correlate this data with indicators of economic and financial development. The ultimate aim of this research will be to contribute to the pool of information and analysis on transitional democracies through the publication of my findings.

**Matthew Poland**, English Literature

“Resonant Spaces: Imagination and Perception in Three English Country-House Novels”

Faculty Mentor: Dr. Raphael Falco, Department of English

Expected Graduation Date: Spring 2008

The country-house novel has become a mainstay of English literature over the last three centuries, originating in the country-house poems of Amelia Lanyer and Ben Jonson in the seventeenth century. My project will focus on how domestic space exerts imaginative power on the characters in three English novels: *Northanger Abbey* by Jane Austen, *Howards End* by E.M. Forster, and *Atonement* by Ian McEwan. By analyzing these novels and conducting research in actual English country homes, I will examine how the country-house novel has evolved over three centuries and how ideas of imagination and perception take shape within domestic spaces. I hope especially to investigate how McEwan's *Atonement*, a recent and popular novel, situates itself in the county-house novel tradition as it brings the genre into the twenty-first century.



**Benjamin Potok**, Department  
“A New Approach to Drum Set Instruction”  
Faculty Mentor: Dr. Skip Morin, Department of Music  
Expected Graduation Date: Spring 2008

The intention of this research project is to develop an original, software based system of drum set instruction. This system will implement a pedagogy that focuses on developing a facile coordination of the fundamental building blocks of rhythm, rather than the methodology of current systems of instruction, which entails replicating common rhythms heard in existing music. This new approach will encourage a learner to explore a far greater number of combinations of rhythms from the most basic components to seemingly endless arrangements of drum set composition and improvisation. This will open a whole new array of rhythmic options that enables a player to take their playing to a more proficient level of creative style. This system represents a more effective, efficient, and progressive method of instruction. The mission of this system will be to encourage a raw beginner to become a unique drum set player who, in addition to all of the standard skills and techniques, has developed his/her own musical styles and preferences that will advance the field of drum set playing (see appendix for examples). The medium of instruction, a computer, will offer improved flexibility over conventional methods and bridge instruction into the twenty-first century, enabling the fundamental rhythmic building blocks to be seen and heard.



**Kau M. Queeglay**, Psychology and Social Work

“Self-Concepts of Adolescent Mothers: The Predictive Role of Social Support and Knowledge of Infant Development”

Faculty Mentor: Dr. Charissa Cheah, Department of Psychology

Expected Graduation Date: Spring 2008

This study examines the predictors of adolescent mothers' self-concept regarding parenting role, specifically, their knowledge of child development, and their social support network. Participants will include approximately 70 low-income pregnant and parenting adolescents residing in Baltimore City. The findings will contribute to intervention programs (i.e. parenting classes) to educate adolescent mothers about child-development milestones and the importance of establishing secure social support networks in helping the adolescent mother adjust successfully to her parenting.



**Amanda Reamy**, Biological Sciences

“Influences of *Dock* and *Dscam* Mutations on the Cellular Immune Response of *Drosophila melanogaster*”

Faculty Mentor: Dr. Jeff Leips, Department of Biological Sciences

Expected Graduation Date: Spring 2008

Parasitoid wasps of fruitflies (*Drosophila melanogaster*) are insects that lay their eggs in *Drosophila* larvae. Unless a successful immune response is mounted, the offspring laid inside the abdominal cavity will mature and eventually consume the *Drosophila* larvae from the inside out. The cellular immune response of *Drosophila* is the predominant mechanism by which these organisms survive an attack by a parasitoid wasp. Other research has been able to gain a better understanding of what constitutes a successful immune response and at least three separate events at the cellular level are accepted as essential if a *Drosophila* larva is to live after a parasitoid attack. These events are 1) recognition of the wasp egg, 2) differentiation and movement of specialized fly blood cells to the parasitoid egg, and 3) encapsulation of the parasitoid egg. Much less is known, however, about how genetic variation consequently affects the efficiency of *Drosophila* hemocytes, or blood cells, in being able to neutralize deadly parasitoids via these cellular processes. The focus of my research is to investigate the influence of two genes, *Dreadlocks* and *Dscam*, during the immune response after a parasitoid attack. Two genetically engineered fly stocks having a mutation in either one of these genes will be tested and scored separately to assay if there is an increase or decrease in mortality rate following a parasitoid attack. Increases in mortality rate will be explained by a reduced or less efficient cellular immune response in comparison with a control. Likewise, decreases in mortality rate will be explained by a better immune response in comparison with a control. Any differences ultimately will be contributed to the genetic mutations present. Confocal microscopy is a separate technique that will be used to confirm and add additional insight to my observations. Using fly rearing techniques, *Dreadlocks* and *Dscam* mutants will be crossed with flies containing a Gal4-UAS system. The Gal4-UAS system will cause the blood cells of each mutant to emit a fluorescent signal that can be detected using confocal microscopy. Therefore the behavior of the blood cells can be analyzed at

different time points following an attack. Analysis of this visual data will allow us to speculate how these mutations directly effect the movement, differentiation and encapsulation ability of blood cells.



**Sasan Salimian**, Biochemistry and Molecular Biology

“Characterization of *HTA8*, a suppressor of the constitutive defense mutant *acd6-1* in *Arabidopsis thaliana*”

Faculty Mentor: Dr. Hua Lu, Department of Biological Sciences

Expected Graduation Date: Spring 2009

Pathogen infection induces a vast array of sophisticated responses in plants, including rapid activation of oxidative burst, defense signal transduction, and gene expression reprogramming. *Accelerated Cell Death 6 (ACD6)*, a membrane protein with ankyrin repeats, is a positive regulator of disease resistance mediated by the key defense signaling molecule salicylic acid (SA). *acd6-1* is a gain-of-function mutant, its hallmarks being its small size, high SA levels, and enhanced disease resistance. Interestingly, reducing SA levels and/or blocking SA signaling in *acd6-1* plants results in reduced defense but increased plant size. This defense-dependent dwarfism in *acd6-1* provides a facile genetic tool in identifying *acd6-1* suppressors (*sup*). The *sup* mutants will have an increased plant sizes and presumably a reduced defense. Surprisingly, one of the *sup* mutants harbours a mutation in the histone H2A (*HTA*) gene. Histone H2As belong to a highly conserved, 13-member protein family that is widely known to play a role in chromosome remodeling. A mutation in *HTA8* gene partially suppresses the *acd6-1* phenotypes, suggesting that *HTA8* may play a role in defense regulation in *Arabidopsis*. To test this hypothesis, we will first confirm that the suppression of *acd6-1* conferred constitutive defense and dwarfism is caused by the *HTA8* mutation. If so, we will subsequently study the pathway by which *HTA8* regulates defense responses in *Arabidopsis*.



**Tanu Sharma**, Biochemistry and Molecular Biology

“High-Level Expression of Melanopsin through a Tetracycline-Inducible Expression System”

Faculty Mentor: Dr. Phyllis Robinson, Department of Biological Sciences

Expected Graduation Date: Spring 2009

Melanopsin is a novel opsin protein expressed in a small subset of retinal ganglion cells found in the retina of the eye. To characterize melanopsin, some biochemical studies require large amounts of purified protein. However, large amounts of melanopsin cannot be isolated from the retina since melanopsin is expressed in a small number of cells. Moreover, the current expression system does not produce sufficient amounts of melanopsin. Therefore, the goal of this project is to engineer an expression system that will produce large amounts of heterologously-expressed melanopsin for use in biophysical and biochemical studies. This goal will be accomplished by first creating a mammalian cell line that is stably transfected with the melanopsin gene. Human embryonic kidney cells, stably

expressing tetracycline-repressor protein, will be used to control the expression of melanopsin. Since the unregulated expression of a protein can be toxic to the cells, the expression of melanopsin will be regulated by a tetracycline operator sequence. Lastly, the functionality of melanopsin expressed heterologously by these mammalian cells will be tested. In conclusion, the use of a stably transfected mammalian cell will allow us to purify large amounts of melanopsin for use in structure and function studies.



**Trevor Simpson**, Music/Recording Arts

“Study of Component-Based Electronics and their Relevance in Historical Recording Methods”

Faculty Mentor: Alan Wonneberger, Department of Music/Recording

Expected Graduation Date: Spring 2009

I intend to develop a technical ability and greater understanding of component electronics involved in the building, repairing, and maintaining of traditional recording equipment. Throughout the history of recorded music, engineers have relied completely on electronic devices for every step in the recording process. Microphones, preamplifiers, compressors, speakers, and nearly every other relevant tool one may use are all comprised of very complex circuits and components that are seemingly foreign to most engineers today. Unfortunately, many of these components, especially those found in some of the best sounding and most expensive vintage pieces, have a tendency to fail and must be replaced every so often. I will engage in a study of traditional recording electronics by which I will be able to create an authentic series of “vintage” recordings predominately with equipment I have built and/or repaired. This study will not only offer me the invaluable ability to repair and improve my own equipment for years to come, but will also serve as a historical study into the methods and equipment used in recording studios during the “Golden Age” of recording, ca. 1950-1980. The end result of this research will be a handbook documenting my work, to reside in the UMBC Recording Studios and benefit all future recording students.



**Kacie Smith**, Psychology/Media and Communication Studies

“The Evolution of Gender Representations in Switzerland: A Content Analysis”

Faculty Mentor: Dr. Jason Loviglio, Department of American Studies and Media and Communication Studies

Expected Graduation Date: Spring 2008

This project will focus on female gender roles as represented in advertisements circulated in print media throughout Switzerland. I will refer to Erving Goffman’s theoretical framework of content analysis to examine the historical evolution of gender images in magazine advertisements. Ultimately, I will uncover visual mechanisms behind Swiss gender stereotyping, analyze how changes in images over time affect these stereotypes by portraying women differently, and determine whether Goffman’s analysis applies cross-

culturally. The results from this study may be applied to future progressive movements for women depicted in visual media.



**Kayleigh A. Somers**, English Literature and Environmental Science  
"Jane Austen's Romantic Attitudes in Nature"  
Faculty Mentor: Dr. Orienne Smith, Department of English  
Expected Graduation Date: Spring 2008

Critics have classified Jane Austen's literary style as neoclassical, although she wrote during the Romantic period. They have discussed little about how the Romantic period influenced Austen's work. To research this discrepancy, I plan on studying Jane Austen's work from an ecocritical perspective. Specifically, I am going to consider how Austen's use of figurative language in her descriptions of nature is often typical of the Romantic movement. I plan to examine at least two novels (*Pride and Prejudice* and *Northanger Abbey*) to support this theory, as well as evaluating a play written by Austen for performance in the home. This manuscript has never been published and is located at the Chawton House in Great Britain. That library along with the collection at Goucher College will provide me with a large amount of first editions of Austen's work whose plates and illustrations of nature I can evaluate. With many sources, I hope to find a better explanation of the influence of the Romantics in Austen's work.